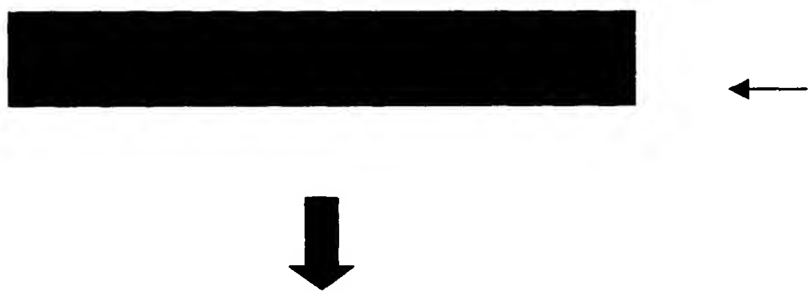
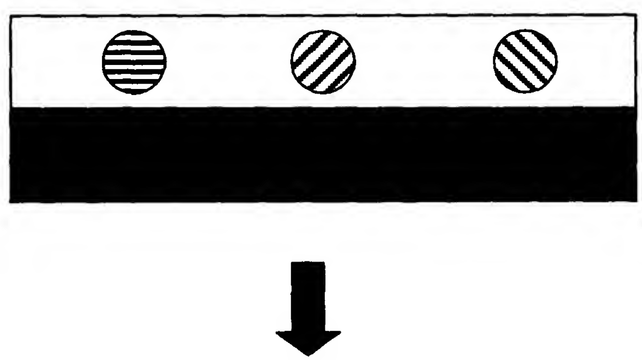
Prior Art 1

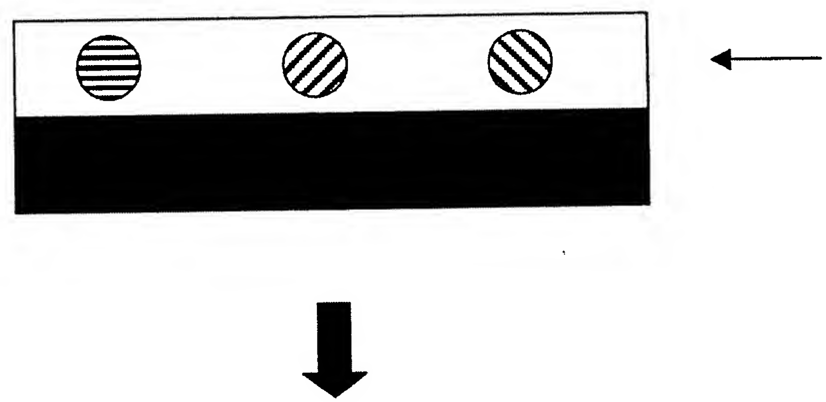


Surface
Figure 1a

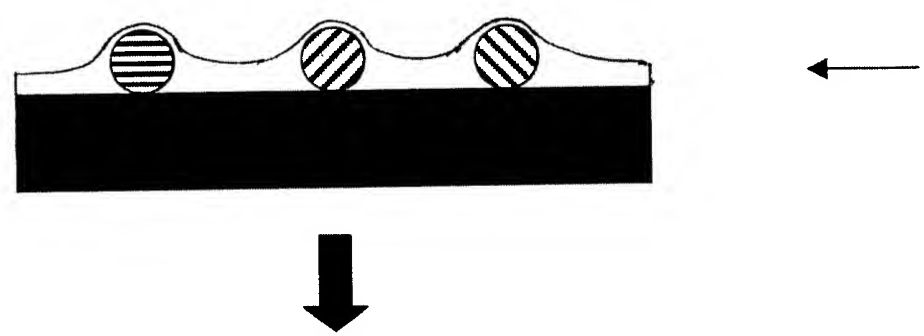


Fluid layer containing micro-spheres, gelling agent and chemical cross-linking agent spread over surface.

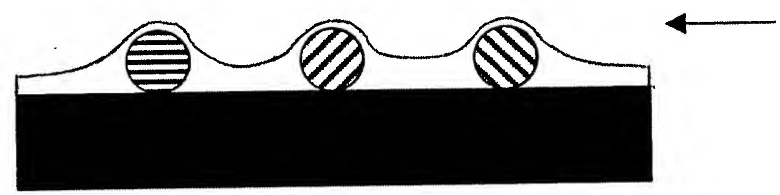
Figure 1b



Gelling agent undergoes physical gelation
Figure 1c



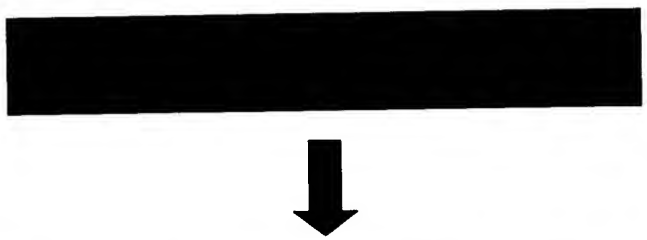
Water evaporated from bead layer
Figure 1d



Cross-linking reaction goes to completion to permanently fix beads in the array

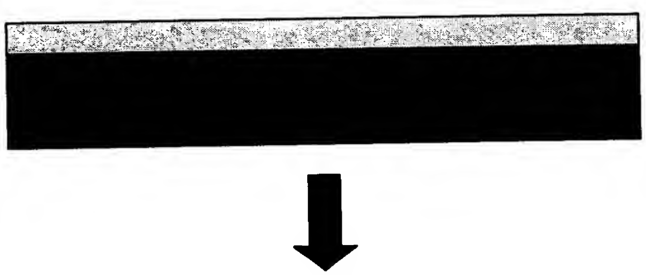
Figure 1e.

Prior Art 2



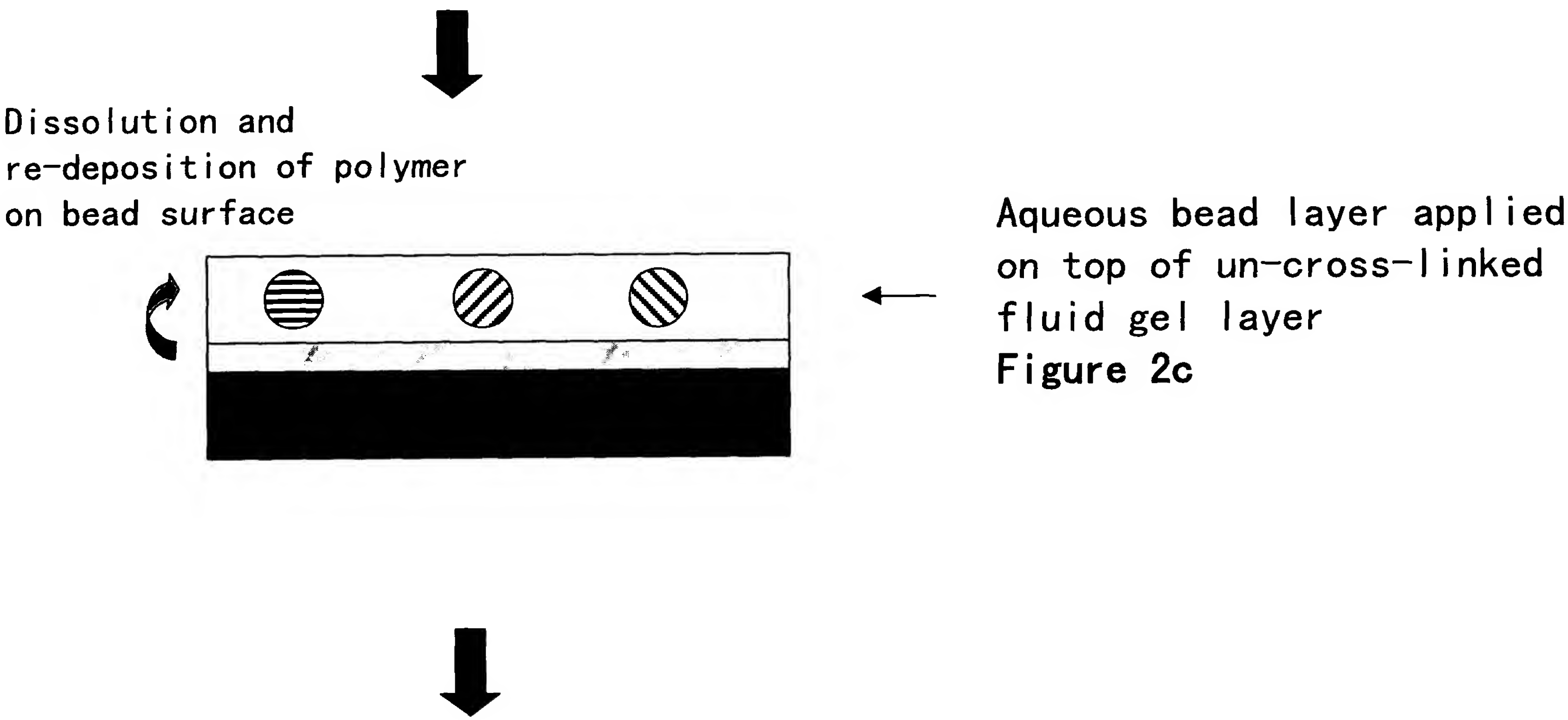
Surface

Figure 2a



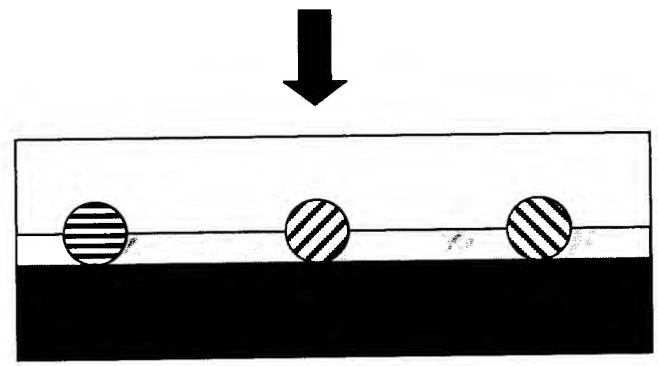
Fluid layer containing gelling agent and slow-acting chemical cross-linking agent spread over surface.

Figure 2b



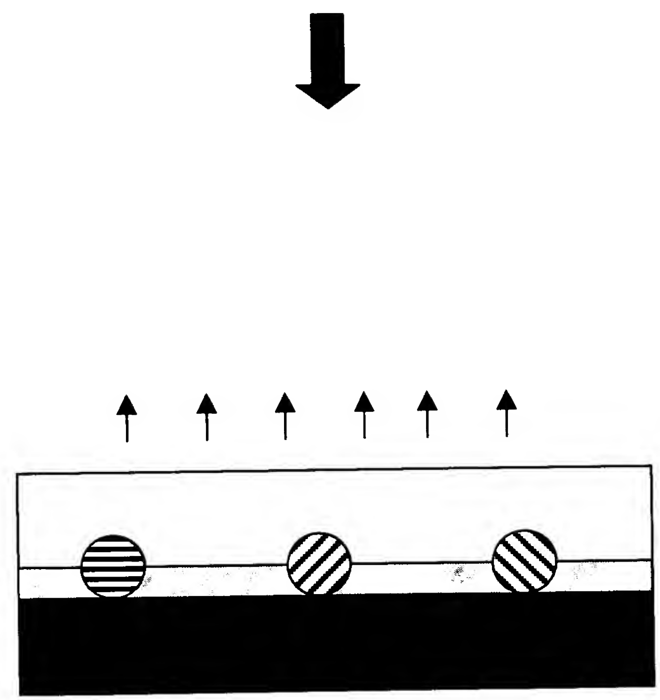
Dissolution and
re-deposition of polymer
on bead surface
Aqueous bead layer applied
on top of un-cross-linked
fluid gel layer

Figure 2c



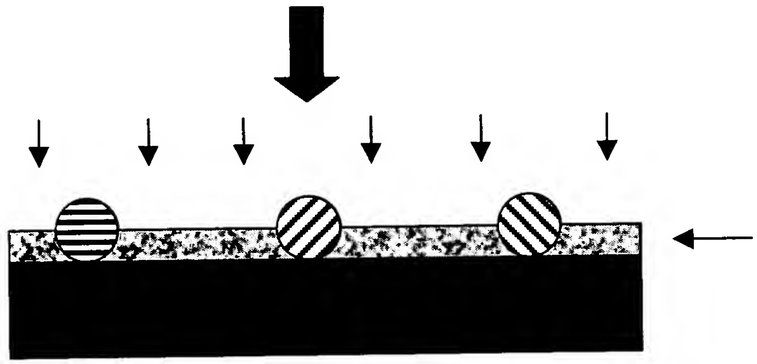
Beads submerge into gel layer due to a gravitational and van der Waals forces

Figure 2d



Water is evaporated from the top layer to expose the surface of the beads

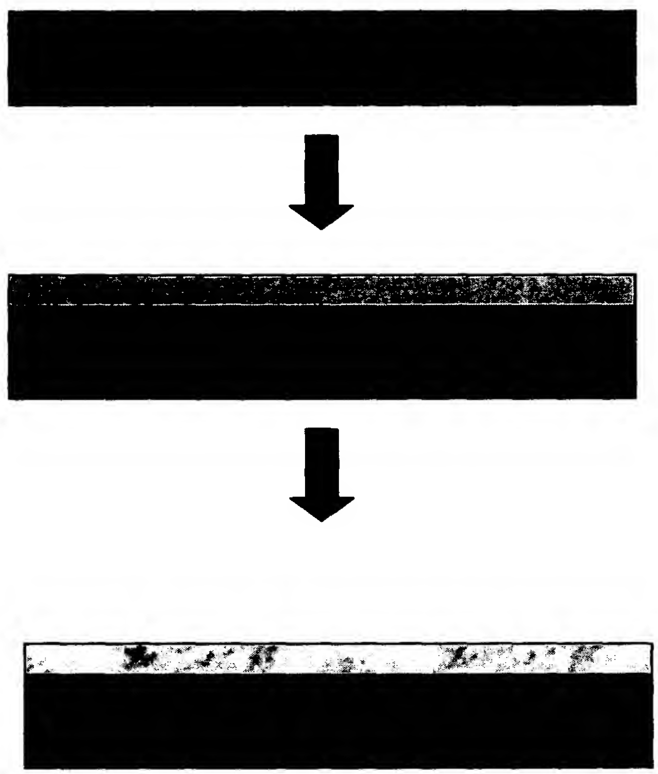
Figure 2e



Chemical cross-linking reaction allowed to go to completion in order to permanently fix the beads

Figure 2f

Invention 1



Surface

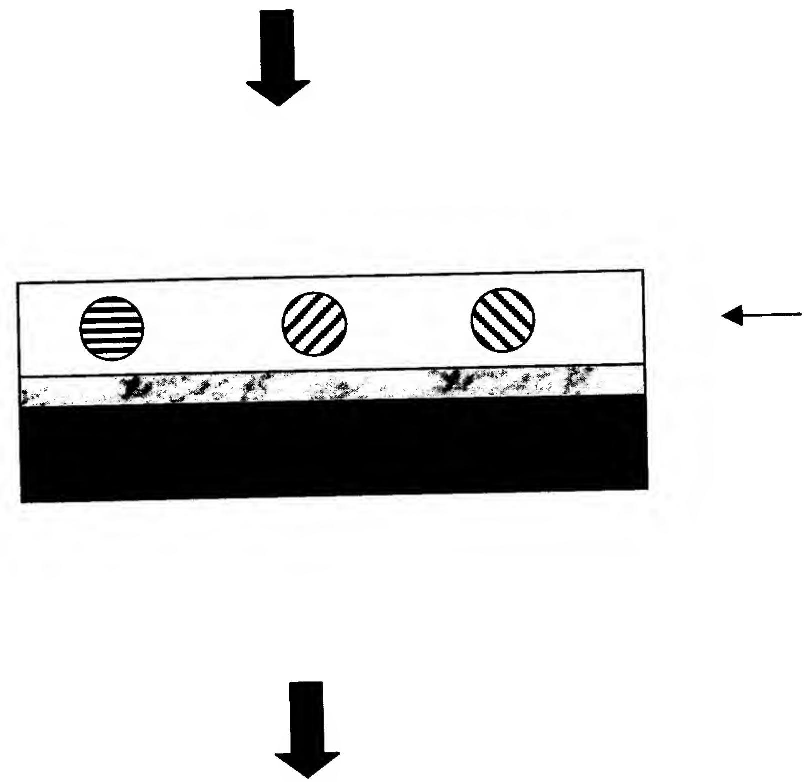
Figure 3a

Fluid layer containing gelling agent and slow-acting chemical cross-linking agent spread over surface.

Figure 3b

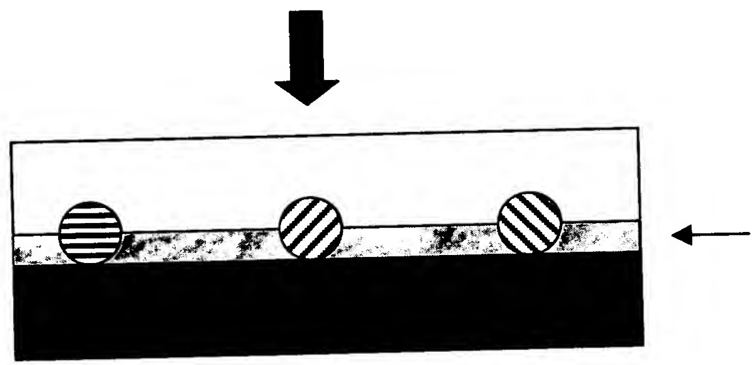
Gelling agent undergoes physical gelation. Cross-link density and elastic modulus adjusted to per indentation by micro-spheres.

Figure 3c



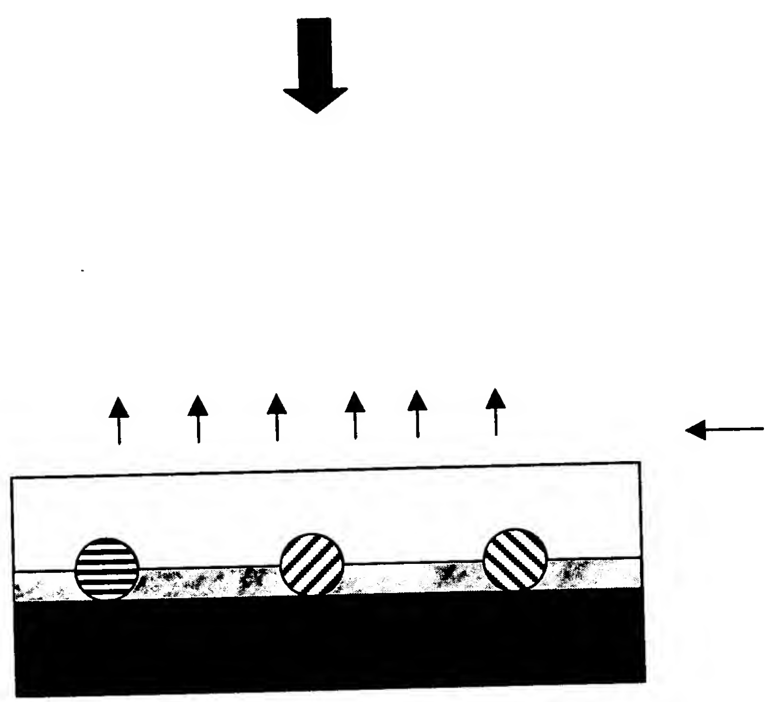
Aqueous bead layer applied on top of gel layer

Figure 3d



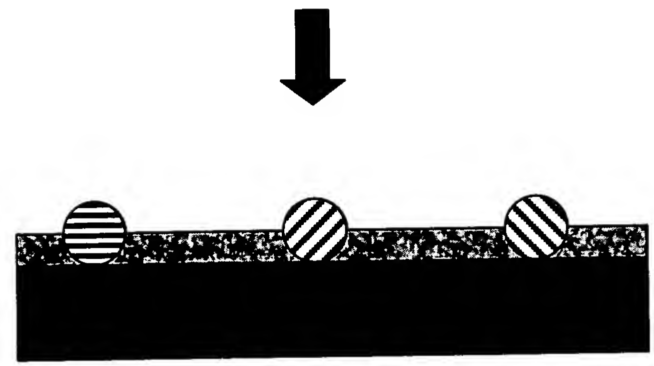
Beads partially submerge into gel layer due to a gravitational and van der Waals forces

Figure 3e



Water is evaporated from the top layer to expose the surface of the beads

Figure 3f

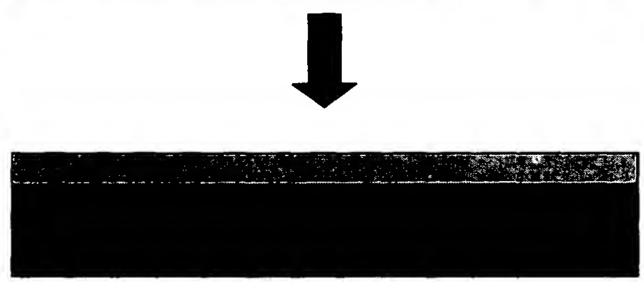


Chemical cross-linking goes to completion to permanently fix the beads

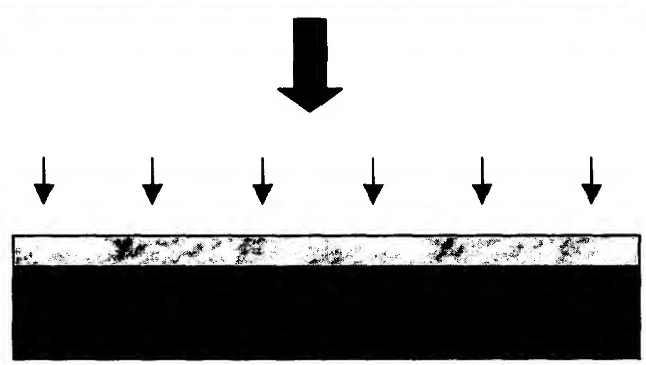
Figure 3g

Invention 2

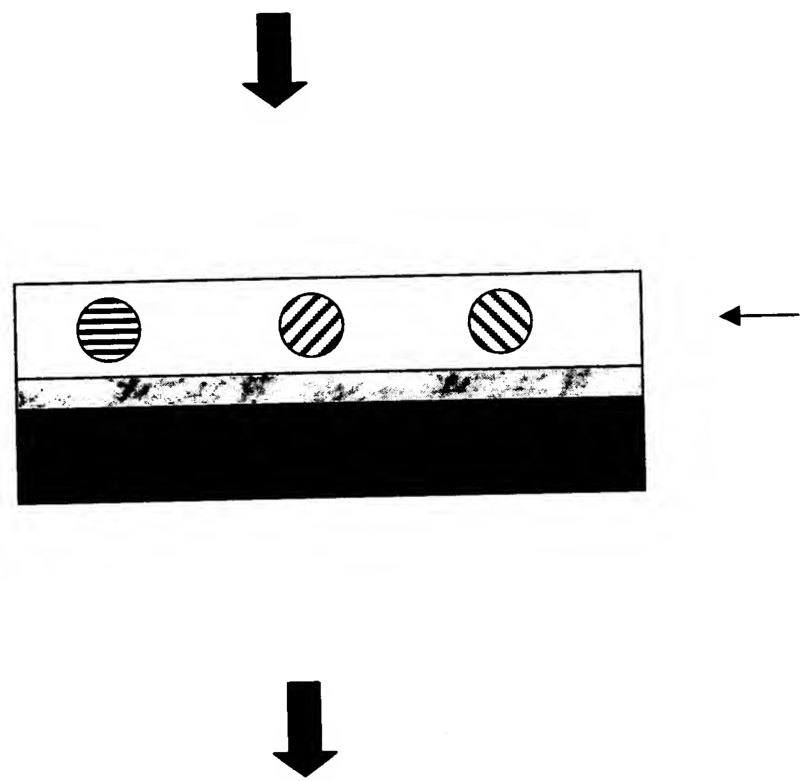
Surface
Figure 4a



Fluid layer containing
gelling agent spread over surface.
Figure 4b

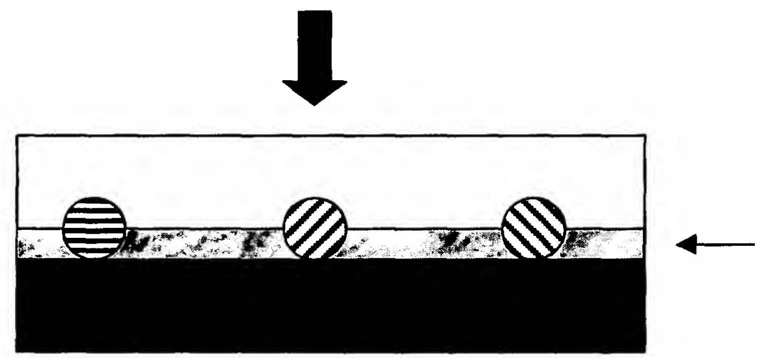


Gelling agent undergoes
gelation by UV irradiation.
Cross-link density and elastic modu
adjusted to permit
indentation by micro-spheres.
Figur 4c



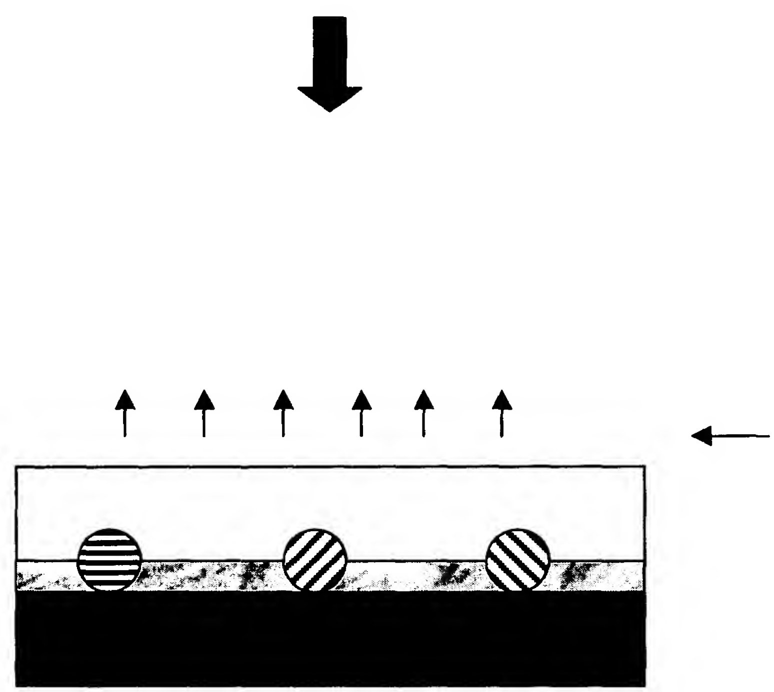
Aqueous bead layer applied on top of gel layer

Figure 4d



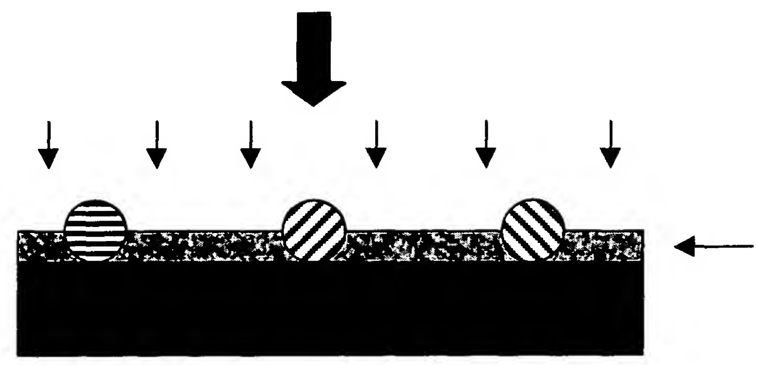
Beads partially submerge into gel layer due to a gravitational and van der Waals forces

Figure 4e



Water is evaporated from the top layer to expose the surface of the beads

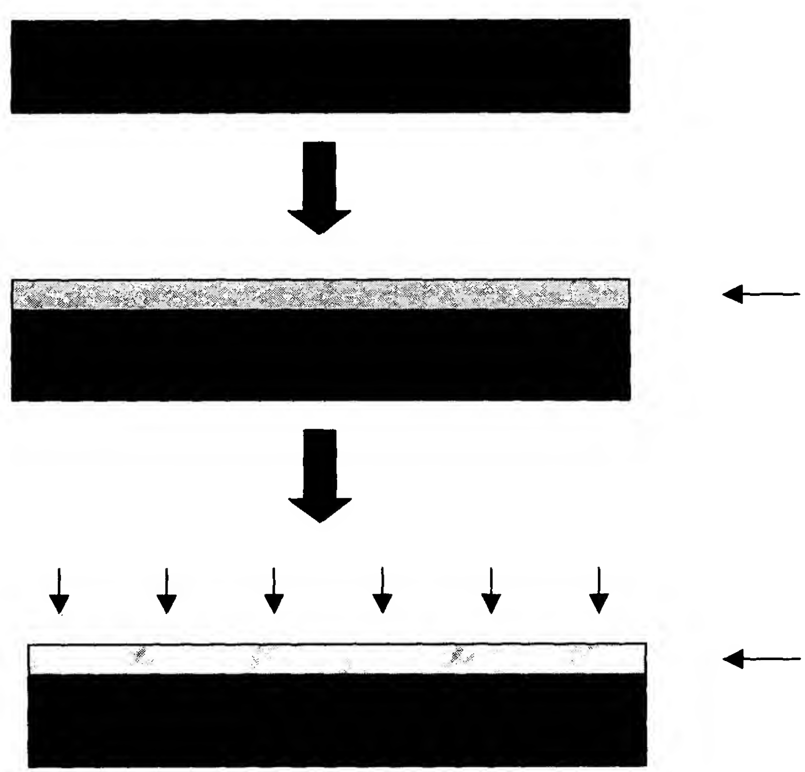
Figure 4f



Additional UV irradiation to increase cross-link density in order to permanently fix the beads

Figure 4g

Invention 3

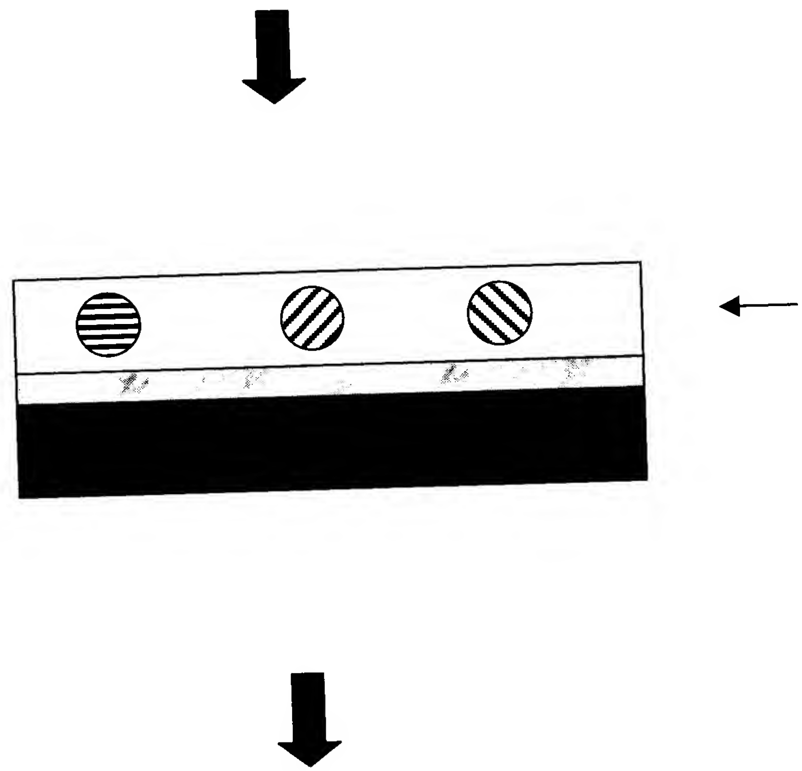


Surface
Figure 5a

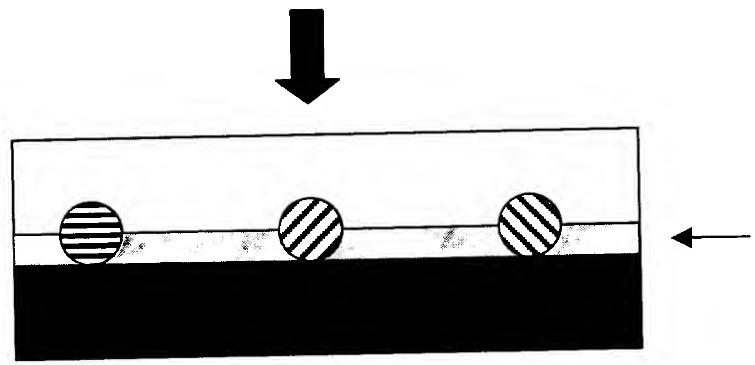
Fluid containing
gelling agent and a slow
acting chemical cross-linking
agent for the gelling agent is
spread over surface
to form receiving layer.

Figure 5b

Gelling agent undergoes sol-gel
transition.
Elastic modulus
adjusted to permit
indentation by micro-spheres.
Figure 5c

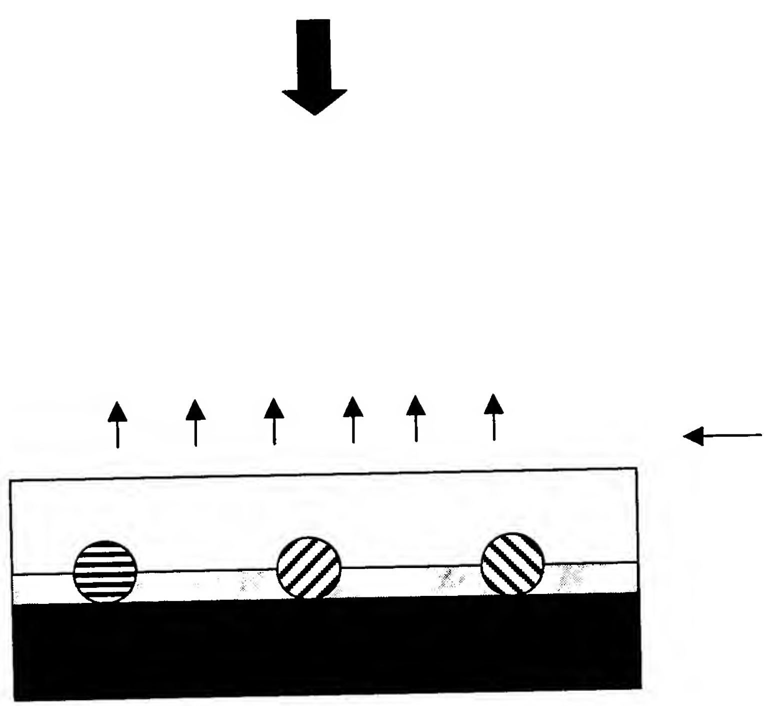


Aqueous bead layer at
a temperature lower than
the sol-gel transition
temperature of the gelling
agent is
applied
on top of cross-linked
receiving layer.
Figure 5d



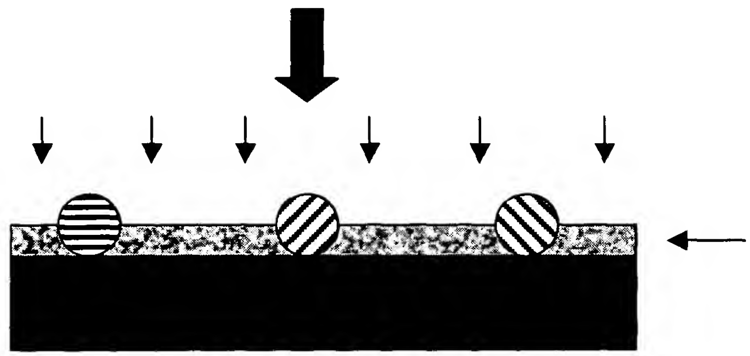
Beads partially submerge into receiving layer due to gravitational and van der Waals forces

Figure 5e



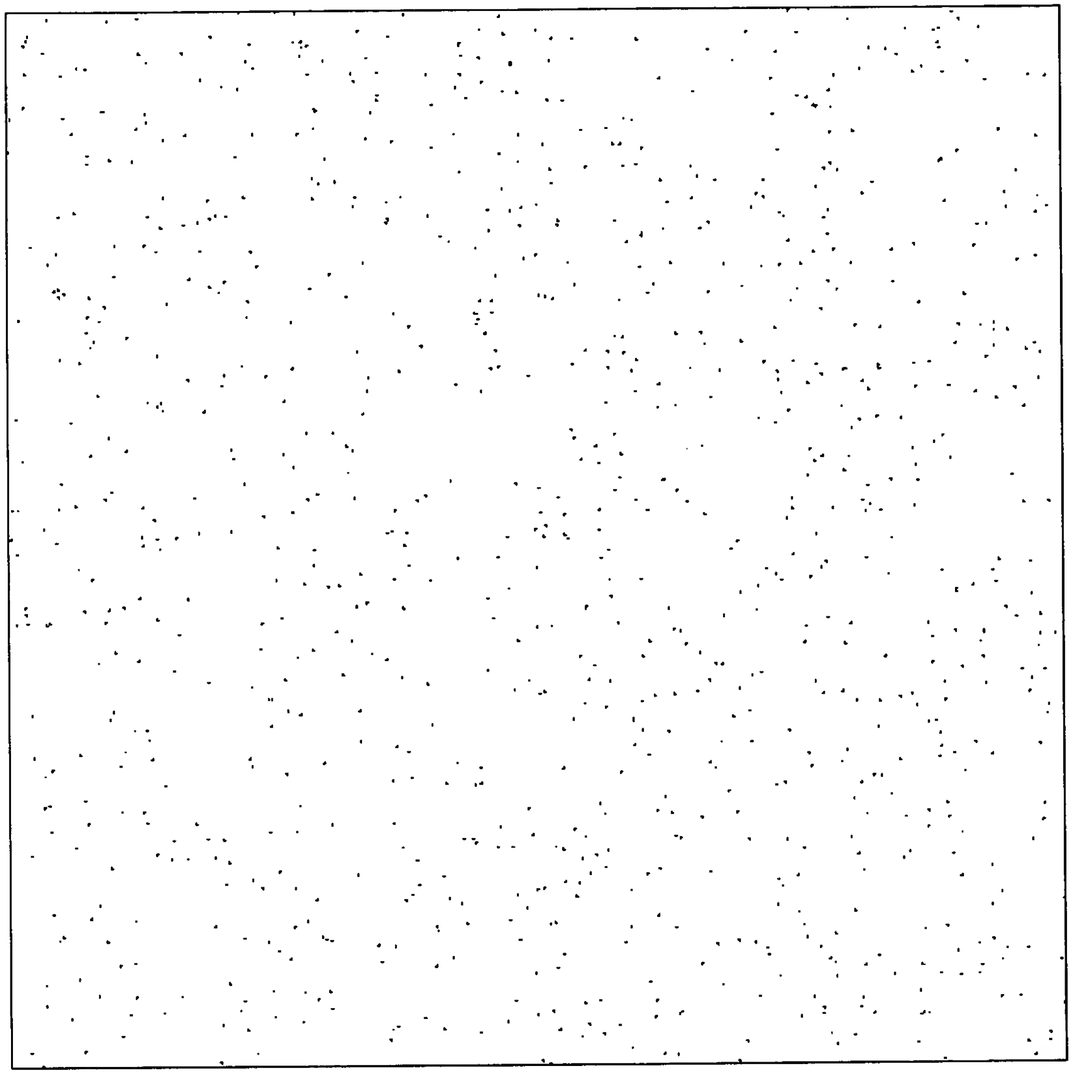
Water is evaporated from the top layer to expose the surface of the beads

Figure 5f

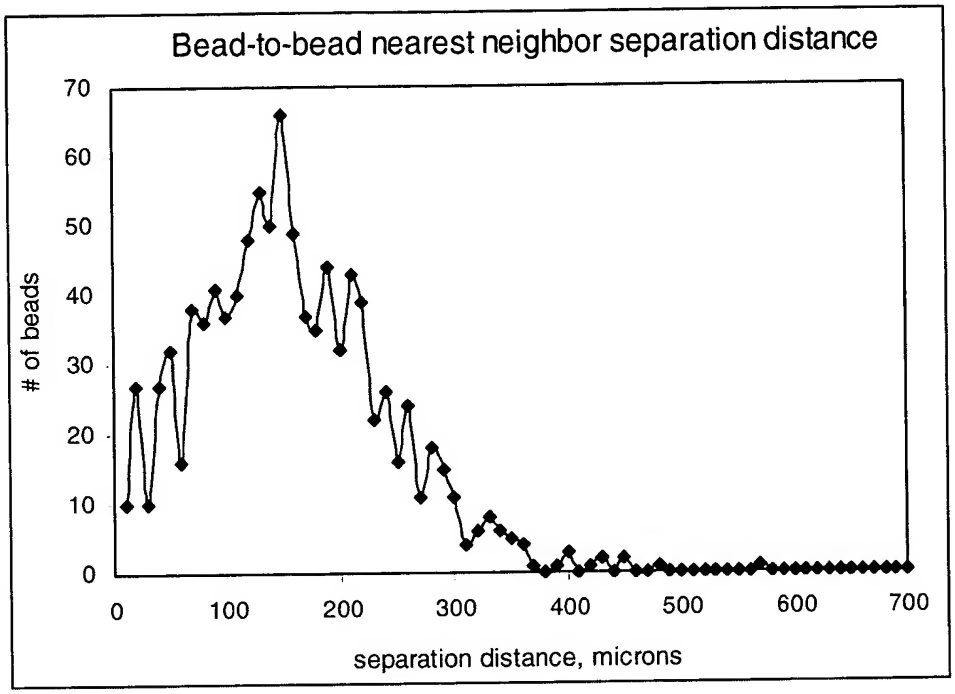


Chemical cross-linking of gelling agent goes to completion to render array robust to wet processing.
Figure 5g

Fig. 6



no. of beads = 1000/sq.cm; particle dia = 10 microns



Bead-to-bead nearest neighbor separation distance
70
60
50
40
30
20
10
0
# of beads
0
100
200
300
400
500
600
700
separation distance, microns

Fig. 7

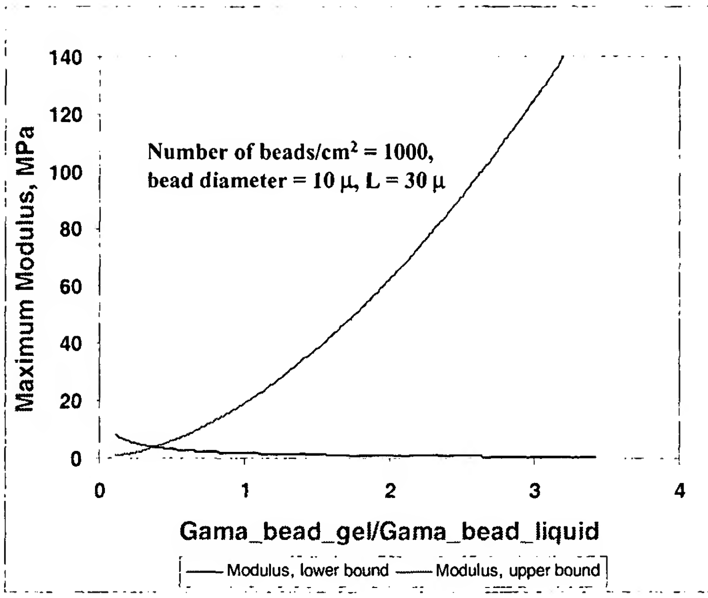


Figure 8. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.

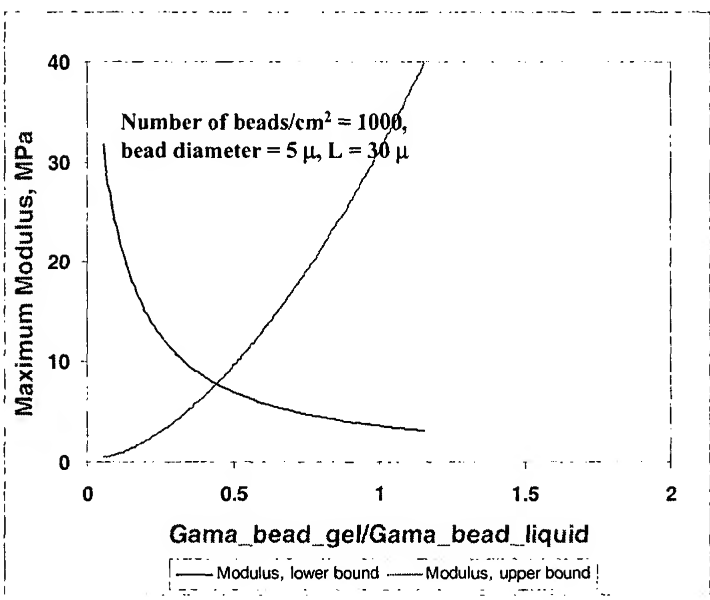


Figure 9. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.

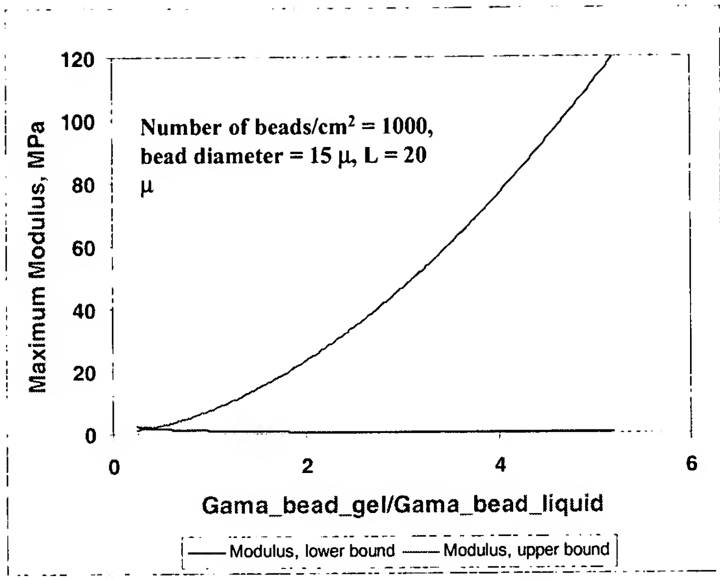


Figure 10. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.

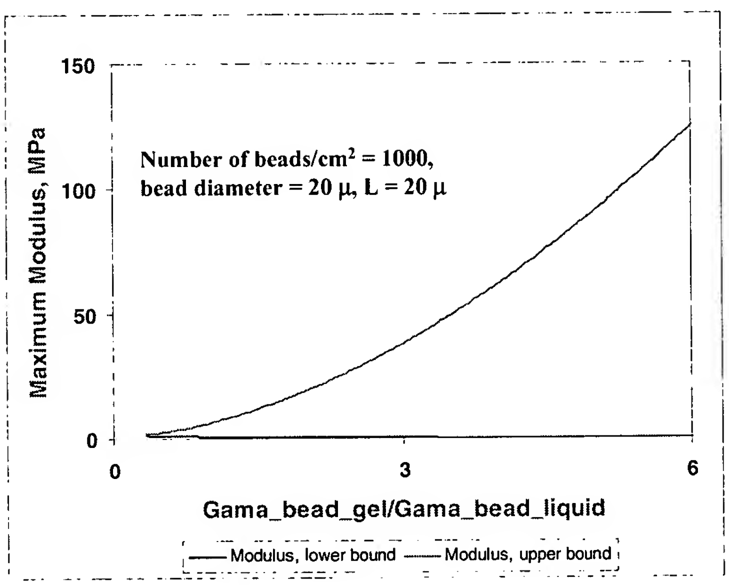


Figure 11. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.

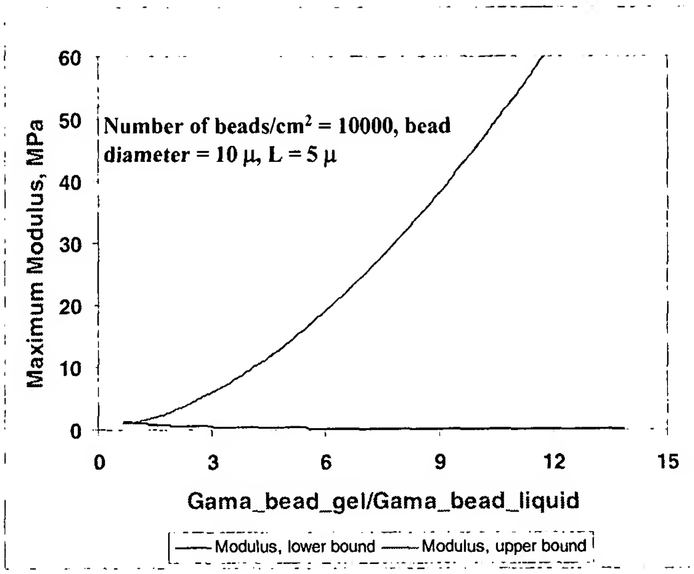


Figure 12. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.

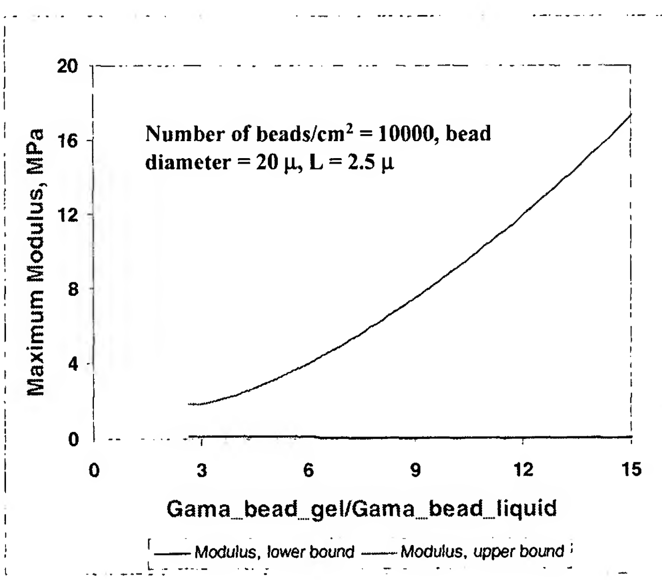


Figure 13. The lower and upper bounds of the feasible modulus is determined from the lower and upper curves.